

James A. ST. VILLE
Serial No.: 09/643,982

Submission Accompanying Request for Continued Examination

REMARKS

Applicant respectfully requests reconsideration and allowance of the subject patent application.

A Listing of Claims is provided for the Examiner's convenient reference.

Claims 1, 4-9, 21-26 and 38-42 were rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over St. Ville (U.S. Patent No. 5,594,651) in view of Castanie et al. (U.S. Patent No. 6,290,889), and further in view of Harada et al. (U.S. Patent No. 5,563,199).

Independent claims 1, 25 and 41 describe methods in which structural fibers of a composite material are laminated in a matrix into which an impurity is introduced, the amount of the impurity introduced into the matrix being controllably variable for the respective volume increments of an object. See, for example, the description on pages 6-7 and page 28 et seq. of the specification.

In connection with the above-described feature of claims 1, 25 and 41, the office action at page 5 references Harada et al. as showing:

that the composite material comprises a resin matrix into which an impurity is introduced (Col 1, Lines 14-22; Col 3, Lines 40-45), the amount of impurity introduced into the resin matrix being controllably variable for the respective volume increments of the object (Col 3, Lines 55-64; Col 18, Lines 28-39), as the impurities act as reinforcing materials (CL1, L21) and that provides a composite material having improved mechanical strength (Col 2, Lines 54-55).

Harada et al. discloses a potassium hexatitanate whisker having a tunnel structure containing aluminum and niobium impurities in such amounts that $\text{Al}_2\text{O}_3/\text{Nb}_2\text{O}_5$ molar ratio is 0.6 or higher. In particular, Harada et al. states at col. 3, lines 40-44 that their invention "provides a composite material comprising a thermoplastic resin matrix or light alloy matrix, reinforced with potassium hexatitanate whiskers having a tunnel structure and containing aluminum and niobium impurities ..."

James A. ST. VILLE
Serial No.: 09/643,982
Submission Accompanying Request for Continued Examination

As noted above, claims 1, 25 and 41 call for the impurity to be introduced into the matrix in which structural fibers are laminated. Harada et al. makes it clear that the aluminum and niobium impurities are contained in the whiskers and there is no disclosure or suggestion whatsoever of introducing impurities into the matrix in which these whiskers are laminated, much less that the amount of the impurity introduced into the matrix is controllably variable for the respective volume increments of an objects. The portions of Harada et al. referenced in the office action confirm that the aluminum and niobium impurities are contained in the whiskers and are not introduced into the resin as claimed.

Because of this deficiency of Harada et al., the proposed combination of St. Ville, Castanie et al. and Harada et al. (even if proper), would not have resulted in the subject matter of claims 1, 25 and 41.

Claims 4-9, 21-24, 26, and 38-40 and 42 respectively depend from one of claims 1, 25 and 41. The proposed combination of St. Ville, Castanie et al. and Harada et al. does not render these dependent claims obvious at least because of the reasons advanced above with respect to claims 1, 25 and 41.

Claims 56 and 2 were rejected under 35 U.S.C. Section 103(a) as allegedly being "obvious" over the proposed combination of St. Ville, Castanie et al. and Harada et al., in further view of Wu et al. (U.S. Patent No. 5,654,077).

Wu et al. does not remedy the above-discussed deficiencies of the St. Ville, Castanie et al. and Harada et al. combination with respect to claim 1, from which claims 56 and 2 depend. As such, even were the combination carried out, the subject matter of these claims would not result.

In addition, as previously discussed, Wu et al. relates to stacking sequences that can be used to provide a multi-material fully isotropic laminate (MFIL) and a multi-material quasi-homogenous anisotropic laminate (MQHAL). A laminate is a flat plate or curved shell consisting of two or more plies stacked and bonded as an integral component for structural applications. Each ply is a uniform thickness layer of material. The

James A. ST. VILLE

Serial No.: 09/643,982

Submission Accompanying Request for Continued Examination

arrangement of the material, thickness, orientation, and stacking sequence of the plies is referred to as the layup of the laminate. MFILs are obtained by shuffling the stacking sequences of certain laminates. As the number of plies increases, the possibility of finding a sequence that constitutes a MFIL also increases. Wu et al. refers to this problem of finding a sequence as an "integer problem" and explains that a computer program is used to systematically search through integer distribution patterns to find patterns that constitute a MFIL. MQHAL layups can be obtained by altering an MFIL.

Applicant respectfully submits that the concept in Wu *et al.* of searching distribution patterns to find patterns that satisfy certain criteria would not have taught or suggested specifying a particular symmetry for the material properties of volume elements in a finite element model. For this additional and independent reason, claims 56 and 2 are believed to be allowable.

Claim 3 was rejected under 35 U.S.C. Section 103(a) as allegedly being obvious over the proposed St. Ville, Castanie et al., Harada et al., and Wu et al. combination, in further view of Legere et al. (U.S. Patent No. 6,087,571). Legere et al. discloses that the uniaxially oriented materials described therein may be transversely isotropic. Among other things, Legere et al. does not remedy the above-discussed deficiencies of the other documents in connection with, for example, claim 1 (from which claim 3 depends). Thus, even assuming that the combination of Legere et al. with the proposed St. Ville, Castanie et al., Harada et al. and Wu et al. combination would have been proper and that the combination were made, the combination would not have resulted in the subject matter of claim 3.

Various documents (i.e., Abatangelo, Johnson et al., Bonadio et al., Warren, Jr., Tadros et al., Slaikeu, Hermann, Phipps et al., and Mavity et al.) are cited as allegedly showing biologic materials, bone, crushed bone, co-factors, biological cells, bio-active material, medications, antibiotics, and radioactive materials as set forth in various dependent claims. Applicant does not acquiesce in the characterizations in the office action of these documents. In any event, none of these documents teaches or suggests

James A. ST. VILLE
Serial No.: 09/643,982
Submission Accompanying Request for Continued Examination

introducing an impurity into the resin matrix of a composite material as claimed in claims 1, 25 and 41. Consequently, the combination of these documents with any or all of St. Ville, Castanie et al. and Harada et al. would not have resulted in the subject matter of these dependent claims.

The pending claims are believed to be allowable and favorable office action is respectfully requested.

Respectfully submitted,

NIXON & VANDERHYE P.C.



Michael J. Shea
Registration No. 34,725

901 North Glebe Road, 11th Floor
Arlington, Virginia 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100
MJS:mjs